

We Claim:

1. A method, comprising:  
receiving a first data value;  
5       executing one or more algorithms, where the one or more algorithms use the first data value;  
calculating one or more suggested pulse generator settings from the one or more algorithms based on the first data value; and  
displaying the one or more suggested pulse generator settings.  
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2. The method of claim 1, wherein receiving the first data value includes sensing a cardiac signal having a QRS complex;  
measuring a duration interval of the QRS complex from the cardiac signal; and  
providing the duration interval of the QRS complex as the first data value for use  
15 with the one or more algorithms.
3. The method of claim 2, including suggesting one or more ventricular chambers in which to provide pacing pulses based on the duration interval of the QRS complex.
- 20 4. The method of claim 3, wherein suggesting one or more ventricular chambers includes suggesting pacing in a left ventricle when the duration interval of the QRS complex is greater than or equal to 120 milliseconds and the difference between  $R_L$  and  $R_R$  is greater than 0, where  $R_L$  is a time at which a depolarization in the left ventricle occurred and  $R_R$  is a time at which the depolarization in a right ventricle occurred.
- 25 5. The method of claim 3, wherein suggesting one or more ventricular chambers includes suggesting pacing in both a left ventricle and a right ventricle when the duration interval of the QRS complex is greater than or equal to 120 milliseconds and the difference between  $R_L$  and  $R_R$  is greater than 0, where  $R_L$  is a time at which a depolarization in the left

ventricle occurred and  $R_R$  is a time at which the depolarization in a right ventricle occurred.

6. The method of claim 3, wherein suggesting one or more ventricular chambers includes suggesting pacing in a right ventricle when the duration interval of the QRS complex is greater than or equal to 120 milliseconds and the difference between  $R_L$  and  $R_R$  is less than or equal to 0, where  $R_L$  is a time at which a depolarization in the left ventricle occurred and  $R_R$  is a time at which the depolarization in a right ventricle occurred.

7. The method of claim 1, wherein receiving the first data value includes sensing an atrial signal having atrial events and a ventricular signal having ventricular events; measuring a duration interval of an P-R interval between an atrial event and a ventricular event; and providing the P-R interval as the first data value for use with the one or more algorithms.

8. The method of claim 7, including suggesting an indicated pacing interval,  $T_n$ , for an AV delay based on the P-R-interval.

9. The method of claim 8, including determining whether the AV-interval is concluded by an intrinsic ventricular beat or a paced ventricular beat, calculating  $T_n$  from  $T_n = a \cdot w \cdot AV_n + (1-w) \cdot T_{n-1}$ , when  $AV_n$  is concluded by an intrinsic ventricular beat, and calculating  $T_n$  from  $T_n = b \cdot w \cdot AV_n + (1-w) \cdot T_{n-1}$ , when  $AV_n$  is concluded by a paced ventricular beat, where  $T_{n-1}$  is the previous value of the indicated P-R interval,  $AV_n$  is the time interval corresponding to the most recent P-R interval, and  $a$ ,  $b$ , and  $w$  are coefficients.

10. The method of claim 1, wherein receiving the first data value includes sensing a right ventricular cardiac signal and a left ventricular cardiac signal, where the right and left cardiac signals include ventricular events;

measuring a duration interval of a V-V-interval between a right ventricular event and a left ventricular event; and

providing the V-V-interval as the first data value for use with the one or more algorithms.

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11. The method of claim 10, including suggesting an LV offset value based on the V-V-interval.

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12. The method of claim 11, including determining whether the V-V-interval is concluded by an intrinsic ventricular beat or a paced ventricular beat, calculating  $T_n$  from  $T_n = a \cdot w \cdot VV_n + (1-w) \cdot T_{n-1}$ , if  $VV_n$  is concluded by an intrinsic ventricular beat, and calculating  $T_n$  from  $T_n = b \cdot w \cdot VV_n + (1-w) \cdot T_{n-1}$ , if  $VV_n$  when  $VV_n$  is concluded by a paced ventricular beat, where  $T_{n-1}$  is the previous value of the first indicated pacing interval,  $VV_n$  is the time interval corresponding to the most recent V-V interval, and  $a$ ,  $b$ , and  $w$  are coefficients.

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13. The method of claim 1, wherein receiving the first data value also includes receiving a request to display one or more suggested pulse generator settings; and displaying an estimated time to complete executing the one or more algorithms to calculate the suggested pulse generator settings.

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14. The method of claim 1, including programming an implantable pulse generator with the suggested pulse generator settings.

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15. A medical device programmer, comprising:  
a data input, where the data input receives a first data value;  
control circuitry, where the control circuitry execute one or more algorithms that use the first data value and calculates one or more suggested pulse generator settings from the one or more algorithms based on the first data value; and

a display screen, where the display screen displays the one or more suggested pulse generator settings.

16. The medical device programmer of claim 15, wherein the first data value is a duration interval of a QRS complex.

17. The medical device programmer of claim 16, wherein the control circuitry includes a receiver/transmitter and a ventricular chamber selector coupled to the data input and the receiver/transmitter, wherein the receiver/transmitter receives intrinsic intracardia electrograms recorded from a left and right ventricle and the ventricular chamber selector determines the difference between  $R_L$  and  $R_R$ , where  $R_L$  is a time at which a depolarization in the left ventricle occurred and  $R_R$  is a time at which the depolarization in a right ventricle occurred, and suggests one or more ventricular chambers in which to provide pacing pulses based on the duration interval of the QRS complex and the difference between  $R_L$  and  $R_R$ .

18. The medical device programmer of claim 17, wherein the ventricular chamber selector suggests pacing in the left ventricle when the duration interval of the QRS complex is greater than or equal to 120 milliseconds and the difference between  $R_L$  and  $R_R$  is greater than 0.

19. The medical device programmer of claim 17, wherein the ventricular chamber selector suggests pacing in both the left ventricle and the right ventricle when the duration interval of the QRS complex is greater than or equal to 120 milliseconds and the difference between  $R_L$  and  $R_R$  is greater than 0.

20. The medical device programmer of claim 17, wherein the ventricular chamber selector suggests pacing in the right ventricle when the duration interval of the QRS complex is greater than or equal to 120 milliseconds and the difference between  $R_L$  and  $R_R$

is less than or equal to 0.

21. The medical device programmer of claim 15, wherein the control circuitry includes a receiver/transmitter and a P-R delay determiner coupled to the receiver/transmitter, wherein the receiver/transmitter receives an atrial cardiac signal having atrial events and a ventricular cardiac signal having ventricular events, and wherein the P-R delay determiner measures a duration interval of an P-R interval between an atrial event and a ventricular event, and provides the P-R interval as the first data value for use with the one or more algorithms.

22. The medical device programmer of claim 21, where the P-R delay determiner suggests an indicated pacing interval,  $T_n$ , for an AV delay based on the P-R interval.

23. The medical device programmer of claim 22, wherein the P-R delay determiner determines whether the AV-interval is concluded by an intrinsic ventricular beat or a paced ventricular beat, and calculates  $T_n$  from  $T_n = a \cdot w \cdot AV_n + (1-w) \cdot T_{n-1}$ , when  $AV_n$  is concluded by an intrinsic ventricular beat, and calculates  $T_n$  from  $T_n = b \cdot w \cdot AV_n + (1-w) \cdot T_{n-1}$ , when  $AV_n$  is concluded by a paced ventricular beat, where  $T_{n-1}$  is the previous value of the indicated P-R interval,  $AV_n$  is the time interval corresponding to the most recent P-R interval, and  $a$ ,  $b$ , and  $w$  are coefficients.

24. The medical device programmer of claim 15, wherein the control circuitry includes a receiver/transmitter and an LV-offset determiner coupled to the receiver/transmitter, wherein the receiver/transmitter receives a right ventricular cardiac signal having ventricular events and a left ventricular cardiac signal having ventricular events, and wherein the LV-offset determiner measures a duration interval of an V-V interval between a right ventricular event and a left ventricular event, and provides the V-V-interval as the first data value for use with the one or more algorithms.

25. The medical device programmer of claim 24, wherein the LV-offset determiner suggests an LV offset value based on the V-V-interval.

26. The medical device programmer of claim 25, wherein the LV-offset determiner  
5 determines whether the V-V-interval is concluded by an intrinsic ventricular beat or a paced ventricular beat, and calculates  $T_n$  from  $T_n = a \cdot w \cdot VV_n + (1-w) \cdot T_{n-1}$ , if  $VV_n$  is concluded by an intrinsic ventricular beat, and calculates  $T_n$  from  $T_n = b \cdot w \cdot VV_n + (1-w) \cdot T_{n-1}$ , if  $VV_n$  when  $VV_n$  is concluded by a paced ventricular beat, where  $T_{n-1}$  is the previous value of the first indicated pacing interval,  $VV_n$  is the time interval corresponding to the most recent V-  
10 V interval, and  $a$ ,  $b$ , and  $w$  are coefficients.